

PATENT COOPERATION TREATY

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INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference P17673PC00/sko	FOR FURTHER ACTION		See Form PCT/IPEA/416
International application No. PCT/NO2005/000058	International filing date (day/month/year) 17.02.2005	Priority date (day/month/year) 20.02.2004	
International Patent Classification (IPC) or national classification and IPC INV. G05B19/418 H04L12/40			
Applicant FMC KONGSBERG SUBSEA AS ET AL.			
<p>1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of 5 sheets, including this cover sheet.</p> <p>3. This report is also accompanied by ANNEXES, comprising:</p> <p>a. <input checked="" type="checkbox"/> <i>(sent to the applicant and to the International Bureau)</i> a total of 2 sheets, as follows:</p> <p><input checked="" type="checkbox"/> sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).</p> <p><input type="checkbox"/> sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.</p> <p>b. <input type="checkbox"/> <i>(sent to the International Bureau only)</i> a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing and/or tables related thereto, in electronic form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).</p>			
<p>4. This report contains indications relating to the following items:</p> <p><input checked="" type="checkbox"/> Box No. I Basis of the report</p> <p><input type="checkbox"/> Box No. II Priority</p> <p><input type="checkbox"/> Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</p> <p><input type="checkbox"/> Box No. IV Lack of unity of invention</p> <p><input checked="" type="checkbox"/> Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</p> <p><input type="checkbox"/> Box No. VI Certain documents cited</p> <p><input type="checkbox"/> Box No. VII Certain defects in the international application</p> <p><input type="checkbox"/> Box No. VIII Certain observations on the international application</p>			
Date of submission of the demand 09.03.2006	Date of completion of this report 29.05.2006		
Name and mailing address of the international preliminary examining authority:  European Patent Office - P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk - Pays Bas Tel. +31 70 340 - 2040 Tx: 31 651 epo nl Fax: +31 70 340 - 3016	Authorized officer Groen, F Telephone No. +31 70 340-4977		



INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.
PCT/NO2005/000058

Box No. I Basis of the report

1. With regard to the **language**, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.
 - This report is based on translations from the original language into the following language, which is the language of a translation furnished for the purposes of:
 - international search (under Rules 12.3 and 23.1(b))
 - publication of the international application (under Rule 12.4)
 - international preliminary examination (under Rules 55.2 and/or 55.3)
2. With regard to the **elements*** of the international application, this report is based on (*replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report*):

Description, Pages

1-10 as originally filed

Claims, Numbers

1-18 filed with telefax on 16.05.2006

Drawings, Figures

1-8 as originally filed

a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing

3. The amendments have resulted in the cancellation of:
 - the description, pages
 - the claims, Nos. 19-22
 - the drawings, sheets/figs
 - the sequence listing (*specify*):
 - any table(s) related to sequence listing (*specify*):
4. This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).
 - the description, pages
 - the claims, Nos.
 - the drawings, sheets/figs
 - the sequence listing (*specify*):
 - any table(s) related to sequence listing (*specify*):

* If item 4 applies, some or all of these sheets may be marked "superseded."

**INTERNATIONAL PRELIMINARY REPORT
ON PATENTABILITY**

International application No.
PCT/NO2005/000058

Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims	1-18
	No: Claims	
Inventive step (IS)	Yes: Claims	1-18
	No: Claims	
Industrial applicability (IA)	Yes: Claims	1-18
	No: Claims	

2. Citations and explanations (Rule 70.7):

see separate sheet

Re Item V

Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

Reference is made to the following documents:

D1: US-A-5 469 150 (SITTE ET AL) 21 November 1995 (1995-11-21)

- 1.1 The document D1 is regarded as being the closest prior art to the subject-matter of claim 1, and shows (the references in parentheses applying to this document):
A control system comprising:
 - a control module (fig. 1, ref. (12)),
 - a plurality of devices connected to the control module (fig. 1),
 - the plurality of devices are removably connected to a common bus (fig 1),
 - the control module comprising all features of a control module plus a bus adapter which provides communication between the internal controller bus and the devices connected to the common bus (col. 7, lines 12-17),
 - each device comprises a bus controller having a unique address and means for communicating with the control module (fig. 5, ref. 230, col. 8, lines 52-59), and
 - the common bus comprises at least one modular cable unit which includes
 - a central junction (fig. 1, ref. (17)),
 - at least one electrical connector and (fig.11, ref (750), col. 15, line 67 - col.16, line 7)
- 1.2 The subject-matter of claim 1 differs from this known control system in that
 - the control system of D1 is not applied in a subsea control system that is mounted on a subsea wellhead, and
 - that according to claim1 at least two control signal supply cables extending between the central junction and the electrical connector are electrically joined at the electric connector.

**INTERNATIONAL PRELIMINARY
REPORT ON PATENTABILITY
(SEPARATE SHEET)**

International application No.

PCT/NO2005/000058

The subject-matter of claim 1 is therefore new (Article 33(2) PCT).

1.3 The problem to be solved by the present invention may be regarded as "How to reliably and profitably apply a fieldbus based control system in a subsea installation, that is mounted on a wellhead"

The solution to this problem proposed in claim 1 of the present application is considered as involving an inventive step (Article 33(3) PCT) because the construction of the fieldbus as defined by claim 1 makes sure, that the fieldbus will work with the maximum signal integrity, and that modules can be removed and connected without the need to do any rewiring.

2 Claims 2-18 are dependent on claim 1 and as such also meet the requirements of the PCT with respect to novelty and inventive step.

CLAIMS

1. A subsea control system in a subsea installation (1) mounted on a wellhead (12), the control system comprising:
 - a control module (14), and
 - a plurality of devices connected to the control module (14), characterized in that
 - the plurality of devices are removably connected to a common bus,
 - the control module (14) comprises a controller (301) which includes an internal controller bus (302) which interconnects a microprocessor (304), a memory (312) and a bus adapter (308) which provides communication between the internal controller bus (302) and said devices connected to said common bus,
 - each device comprises a bus controller having a unique address and means for communicating with the control module (14), and
 - the common bus comprises at least one modular cable unit which includes
 - a central junction (93),
 - at least one electrical connector (90a, 90b...90n) and
 - at least two control signal supply cables (94, 98, 102) extending between said central junction (93) and said electrical connector, the least two control signal supply cables (94, 98, 102) being electrically joined at said electrical connector (90a, 90b...90n).
2. A control system according to claim 1, wherein the cable unit comprises a cable (40) having at least one electrical connector (44) at each end.
3. A control system according to claim 1, wherein the cable unit comprises a distribution hub (50, 54, 58) having at least two electrical connectors (45).
4. A control system according to claim 1 wherein the cable unit comprises an end termination (42, 90n).
5. A control system according to claim 1, wherein the cable unit comprises a repeater (55).
6. A control system according to claim 1, wherein the cable unit comprises an extension of said common bus.
7. A control system according to claim 2 wherein said at least one electrical connector is connected to at least one of said plurality of devices.
8. A control system according to claim 1 wherein the common bus comprises a CAN bus.
9. A control system according to claim 1, wherein at least one of said plurality of devices comprises a battery (36).

10. A control system according to claim 1, wherein at least one of said plurality of devices comprises an electro-hydraulic pod (80).
11. A control system according to claim 1, wherein at least one of said plurality of devices comprises an actuator (13).
- 5 12. A control system according to claim 1, wherein at least one of said plurality of devices comprises a sensor (62).
- 10 13. A control system according to claim 1, wherein said cable unit further comprises at least one electrical connector and at least two control signal return cables (96, 100, 102) extending between said central junction (93) and said electrical connector.
14. A control system according to claim 1, wherein said cable unit further comprises a signal component (108).
15. A control system according to claim 1, wherein said cable unit further comprises at least one electrical connector and at least two control signal cables, each of said control signal cables comprising a current loop which is routed through each said electrical connector and through said central junction.
16. A control system according to claim 2, wherein at least one electrical connector comprises a female connector (45).
17. A control system according to claim 2, wherein at least one electrical connector comprises a male connector (44).
- 20 18. A control system according to claim 2, wherein at least one electrical connector comprises a signal termination component (118).